

Engineering Clean Air

E-Newsletter Brought to You by Purafil Technical Services

November 2011



Purafil's scientists and researchers publish this e-newsletter specifically for the engineering community. This exclusive newsletter will include information and explanations on the latest technology changes, regulations, standards, solutions, research findings and other information of value to consulting and specifying engineers.

Please feel free to forward to your engineering colleagues and have them join the Engineering Clean Air e-newsletter community by clicking the link to the right.

Sincerely,
Technical Services Department
Purafil, Inc.

About Purafil, Inc.

For more than 40 years, Purafil has been a world leader in the development of gas-phase air filtration media and systems designed to eliminate and control gaseous contaminants. We were the first to propose standards for industrial facilities using electronic process controls. Today, these standards are used worldwide.

Purafil offers the widest variety of gas-phase air filtration media and award-winning systems for the control of any Indoor Air Quality (IAQ) challenge. Purafil provides engineered, clean air solutions in an array of markets including commercial, industrial, water wastewater, museums and cleanrooms. Purafil's dry-chemical air cleaning media removes specific gases and contaminants from high-volume facilities in order to control corrosion, improve process reliability and IAQ, as well as save money.

Purafil's state-of-the-art laboratory and research facility offers valuable customer services, such as media life analysis, air quality assessment, and circuit board failure evaluation. In addition to those valued process, Purafil also offers a variety of technical services to ensure clean air and customer satisfaction. Purafil's ongoing commitment to quality, customer satisfaction and safety are exemplified by earning the latest ISO 9001:2008 certification, numerous industry awards and an obligation to the research and development of new clean air technologies.

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Do You Smell Something Burning?

For safety and insurance purposes, most if not all mechanical codes have requirements with regards to fire safety for materials used in a building's HVAC systems. For instance, the State of Ohio (USA) Mechanical Code states in the section on "Air Filters" that:

- *Media-type and electrostatic-type air filters shall be listed and labeled. Media-type air filters shall comply with UL 900.*

Similarly, the Hong Kong Fire Services Department requirements for filters used in mechanical ventilating systems state that:

Air filters cells (i.e. media plus media enclosure) shall be constructed from materials which conform to the fire property requirements of one of the following standards:

- **British Standard 476**: Part 4 - Non-combustibility Test for Materials;
- **British Standard 476**: Parts 6 - Method of Test for Fire Propagation for products with indices "I" ≤ 12 and "i1" ≤ 6 ;
- **UL 900** - Test Performance of Filter Units, Class 1 or Class 2;
- **DIN 53438 Part 3** - Response to Ignition by a Small Flame, Surface Ignition, Class F1.



Flammability Rating Standards

Whether they refer to standards developed by Underwriters Laboratories, Inc. (UL), the British Standards Institute (BSI), the Deutsches Institut für Normung e.V. (DIN, the German Institute for Standardization), or another national or international organization, they all have the same goal in mind, that being criteria deemed appropriate for public safety. These standards are essential to public safety and confidence, reducing costs, improving quality, and marketing products and services. Millions of products and their components are tested to rigorous safety standards with the result that consumers live in a safer environment than they would have otherwise. However, even when a product has been classified under one or more of these rating systems, it is generally accepted that the results of flammability/combustibility tests performed on products for materials under controlled laboratory conditions are not directly indicative of the general fire hazard.

UL 900 - Standard for Air Filter Units has been the predominant standard used by the filtration industry to rate both particulate and chemical filters. It provides a test method to determine the amount of smoke generated and the combustibility of air filter units of both washable and disposable types used for the removal of dust and other airborne particles from air circulated mechanically in equipment and systems installed in accordance with the Standards for Installation of Air Conditioning and Ventilating Systems, National Fire Protection Association (NFPA) 90A (Other Than Residence Type), Installation of Warm Air Heating and Air Conditioning Systems, NFPA 90B (Residence Type), the International Mechanical Code, the International Fire Code, and the Uniform Mechanical Code.

Since the smoke generation of an air filter unit, as well as its combustibility, depends upon the nature and quantity of the material collected by the filter, the test requirements of this standard, for classification purposes, apply only to air filter units in a clean condition. Consequently, when filters are susceptible to the accumulation of combustible deposits, it is intended that maintenance and inspection practices should be followed as proposed in Appendix B of NFPA 90A.

For HVAC and HEPA type air filters, UL 900 establishes smoke and flammability limits for clean air filters according to two classifications:

UL Class 1 – air filters which, when clean, do not contribute fuel when attacked by flame and emit only negligible amounts of smoke.

A Class 1 air filter unit shall not produce flame or sparks when subjected to the flame exposure. Spot flame tests described in the testing standard, and during the flame-exposure test, shall not cause the development of an area of more than 2½ square inches as measured below the smoke-density time curve.

UL Class 2 – air filters which, when clean, burn moderately when attacked by flame, or emit moderate amounts of smoke, or both.

A Class 2 air filter unit shall not produce flame or extensive sparks, which are sustained beyond the discharge end of the test duct, described in this Standard, when subjected to the flame exposure test, and shall not cause the development of an area of more than 9 square inches as measured below the smoke-density time curve.

In the future, filters will only be required to meet the requirements that were formerly recognized as UL Class 2. Filter frames and labels will carry one marking to designate that they meet the requirements of the standard. Purafil has started the conversion process and will be in compliance well before the effective date of May 2012. The Underwriters Laboratories website provides complete listings as to which manufacturers follow the procedures as prescribed in the Standard and which of their filters are in compliance.

The most current listing of Purafil's UL rated products is shown in the figure below and can also be found at UL's online certifications directory. [Click here to view the Purafil UL listing](http://www.ul.com/global/eng/pages/) or visit <http://www.ul.com/global/eng/pages/>.



ONLINE CERTIFICATIONS DIRECTORY

**AJZV.R6280
Filter Units, Air**

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Filter Units, Air

[See General Information for Filter Units, Air](#)

PURAFIL INC

2654 WEAVER WAY
DORAVILLE, GA 30340 USA

R6280

Replaceable medium, dry type air filter units, "Purafil Cell, Model PC-12A, -12C, -12D, -22A, -22C, -22D", Class 1; "Purafil Cell, Models PC-12AP, PC-12CP, PC-12DP, PC-22AP, PC-22CP, PC-22DP"; "Purafil Module, Models PK-12, PK-18, PM-9P, PM-12DP, PM-18P, CK-12/24", Class 2.

Replaceable medium, dry type air filter units, "Purafil Module, Models PM-9, PM-12D, PM-18", Class 1 or Class 2.

Replaceable medium, dry-type, Purafil, Purafil Chemisorbant, Purafil Odoroxidant, Purafil Select CP Blend, Purafil Select, Purafil Select Chemisorbant, Purafil Select Odoroxidant, Purafil Select CP Blend, Permasorb, Permasorb Select, Puralum, Puralum Select, Petrosorb, Purafil ES, Purasorb, Chlorosorb, Purafil SP, SP Blend, Triple Blend, Purafil Odoroxidant SP, Odormix SP, Class 1.

Replaceable medium, dry-type, Puracarb, Puracarb PP1505, Puracarb 4016, CSO, Chemicarb, Odorcarb II, Puracarb 50/50, Chemicarb SP, Odorcarb Ultra, Class 2.

Replaceable medium dry-type, Purakol II, Chlorosorb II, Chlorosorb Ultra, Class 2.

Throw-away, dry-type air filter units, Maximum depth 12 in., "JFL-90", Class 1.

Throw-away, dry-type air filter units, maximum depth 4 in. "Purafilter P-800", Class 2.

Throw-away, dry-type air filter media, designated "K-550", "P-800", Class 2.

Replaceable medium, dry-type, designated Puracarb AM, Class 1.

DIN 53 438 Part 3 for testing of combustible materials comes from the confirmation that it is necessary to define both edge and surface ignition in order to assess combustibility characteristics. This does not include methods for the determination and evaluation of the loss of flaming material through dripping, since a classification of materials in this respect may present serious problems or even be misleading.

The test procedures specified in the standard have been tested experimentally. The method is for plastics, wood, paper, etc. Similar standards have been drawn up for textiles (see DIN 54 332 and DIN 54 336). Since test standards are intended to serve as a suitable basis for legal requirements and for production control and for testing products during development and in use, both methods of tests have been given a classification system.

Our Purafilter adsorbent-loaded nonwoven fiber filters were tested according to the requirements of DIN 54 348 Part 3 and the results of testing for the SPB-500/30 combination chemical + Particulate filter medium are shown in the table below. This media is used to produce both commercial and heavy-duty grades of Purafilters. The filter frame material tested is used in the production of both 2" and 4" Purafilters. The results of both tests verify that these materials meet the requirement of Class F1. For the 12" Purafilters, either galvanized, aluminum, or stainless steel frames are used and are not subject to these testing requirements.

PURAFILTER PRODUCT SUMMARY			
Filter Depth	2"	4"	12"
Filter Grades	Commercial	Commercial, heavy duty	Commercial, heavy duty, cleanroom
Filter Medium	SPB-500/30 chemical filter medium complying with requirements of DIN 53438 Part 3: 1984 Class F1		not applicable
Frame Material	Paperboard complying with requirements of DIN 53438 Part 3: 1984 Class F1		GI / aluminum / SS
Maximum Size	24 x 24 x 2"	24 x 24 x 4"	24 x 24 x 12"

The British Standards 476 Fire Tests Series are for determining the fire resistance of building materials and building elements. When designing a building a very important consideration is how it will behave in fire and ensure the elements of structure will not collapse but remain standing or hold back the fire for a prescribed time. The building regulations stipulate the rules and the degree of fire resistance of the elements of structure. However, British Standard 476 dictates the appropriate fire tests for these elements of structure/materials and grades the level of fire resistance.

BS 476-4:1970 specifies a method of test for determining whether building materials are non-combustible within the meaning of the definition. Materials used in the construction and finishing of buildings or structures are classified "non-combustible" or "combustible" according to their behavior in the "non-combustibility test". This test is intended for building materials, whether coated or not, but it is not intended to apply to the coating alone.

BS 476-6:2009 specifies a method of test for fire propagation for products including building materials and structures. It provides a determination of the fire test performance of products used as internal linings in buildings.

From the time Purafil started selling "Purple Pellets" almost 40 years ago; most of our products have been classified according to one or more of these standards for fire safety. This includes our granular media products, media modules and frames, Purafilters, and particulate filters. These published standards ensure that the end user is receiving products that meet a specific level of quality.

Purafil will continue to develop products that not only set the standard for chemical filtration performance but also provide air cleaning options for almost any application. For more information on Purafil products and how they can be applied for a specific application, contact us at 1-800-222-6367 (U.S.), 1-770-662-8545 (all others), send us an e-mail at technicalservices@purafil.com, or visit our website at www.purafil.com.

Contaminant of the Month



Hydrogen fluoride (HF, molecular weight 20.01) is a colorless gas and the principal industrial source of fluorine. It is used often in the aqueous form as hydrofluoric acid, and thus is the precursor to many important compounds including pharmaceuticals and polymers. Hydrogen fluoride boils just below room temperature whereas the other hydrogen halides condense at much lower temperatures. Unlike the other hydrogen halides, HF is lighter than air and diffuses relatively quickly through porous substances.

Major industrial uses of hydrogen fluoride include the synthesis of fluorocarbons (e.g., Freon and Teflon) and the production of aluminum fluoride and synthetic cryolite for use in aluminum refining. It is also employed in refining uranium for use as a nuclear fuel, in manufacturing various organic chemicals, in producing stainless steel, and for various other applications. Hydrogen fluoride is widely used in the petrochemical industry.

Hydrogen fluoride is produced commercially by heating purified fluorspar (calcium fluoride) with concentrated sulfuric acid to produce the gas, which may be condensed by cooling or dissolved in water. Hydrogen fluoride is available commercially either in an anhydrous (water-free) state or in water solutions of various concentrations. Because it attacks glass, it is usually stored in steel tanks, cylinders, or drums, or, in small amounts, in plastic bottles.

Hydrogen fluoride is a highly dangerous gas, forming corrosive and penetrating hydrofluoric acid upon contact with tissue. The gas can also cause blindness by rapid destruction of the corneas. Upon contact with moisture, including tissue, hydrogen fluoride immediately converts to hydrofluoric acid, which is highly corrosive and toxic, and requires immediate medical attention upon exposure.

In the presence of moisture, hydrogen fluoride reacts readily with copper, tin, silver, and iron alloys. These reactions are significant even when the gases are present at low parts per billion levels. Particular care must be given to electronic and other equipment that is exposed to atmospheres which contain hydrogen fluoride.

The control of hydrogen fluoride and other inorganic halides can be achieved using Purafil's dry-scrubbing media products including [Puracarb®](#) and [Purafil® SP](#). Visit the [Purafil website](#) for more information on the control of sulfur dioxide and many other corrosive gaseous contaminants.

Purafil Solutions – Puracarb®



Puracarb® media is manufactured specifically for the corrosive environments and consists of generally spherical, porous pellets. Composed of carbon, alumina and other binders, Puracarb pellets are impregnated during pellet formation, such that the impregnant is uniformly distributed throughout the pellet volume and is totally available for reaction.

THE CHEMISORPTIVE PROCESS

The Purafil chemisorptive process shall remove contaminant gases by means of adsorption, absorption, and chemical reaction. Gases shall be trapped within the pellet where oxidation changes the gases into harmless solids, eliminating the possibility of desorption.

Related Links/Information/Events

Purafil, Inc. will be attending meetings and/or presenting papers on data center and mission critical facility contamination control and monitoring in a number of venues:

- **ISHVAC 2011** – November 6-9, 2011, Tongji University, Shanghai, China (<http://www.ishvac2011.org>). Purafil is presenting a paper titled “*Controlling Gaseous and Particulate Contamination in Data Centers*” and one of the co-authors on a second paper titled “*Room Temperature NOx Removal over Carbon Nanofibers Fabricated by Electrospinning Method.*”
- **ASHRAE 2012 Winter Conference** (Technical Committee 9.9: Mission Critical Facilities, Technology Spaces and Electronic Equipment) – January 21-25, 2012, Chicago, Illinois (<http://ashrae.org/events/2012-winter-conference>).

Companion Paper

Read the third-party testing results on how Puracarb can effectively remove hydrogen fluoride: [“HF Capacity Testing for Puracarb”](#)